

[0065] WHAT IS CLAIMED IS:

1. A surgical instrument, comprising:
a housing;
an electrical power source;
an output shaft extending from the housing;
a rotor coupled to the output shaft,
 wherein at least a portion of the rotor comprises a magnet having a remanence
 greater than or equal to about 1 T; and
a stator having:
 a winding selectively connectable to the electrical power source; and
 a magnetically conductive portion disposed about the rotor and comprising a
 plurality of laminations;
wherein selectively connecting the electrical power source and the stator windings
 imparts rotary motion to the output shaft via the rotor.
2. The surgical instrument of claim 1, further comprising a protective layer disposed
between the stator and the rotor.
3. The surgical instrument of claim 1, wherein the protective layer comprises brass.
4. The surgical instrument of claim 1, wherein the remanence of the magnet is greater than
or equal to about 1.15T.
5. The surgical instrument of claim 1, wherein the remanence of the magnet is greater than
or equal to about 1 T after being autoclaved.
6. The surgical instrument of claim 1, wherein the magnet is a neodymium-iron-boron
magnet.
7. The surgical instrument of claim 1, wherein the winding is a self-supporting winding.

8. The surgical instrument of claim 7, wherein the self-supporting winding is selected from the group consisting of a Faulhaber winding, a rhombic winding, concentric windings, or a self-supporting winding A.
9. The surgical instrument of claim 8, wherein the self-supporting winding is a self-supporting winding A.
10. The surgical instrument of claim 8, wherein the winding comprises a rectangular shaped conductive element.
11. The surgical instrument of claim 8, wherein the winding comprises a conductive element and a thermoplastic element, wherein the thermoplastic element is disposed about the conductive element.
12. The surgical instrument of claim 1, wherein each of the plurality of stator laminations has a thickness of less than about 0.25 mm.
13. The surgical instrument of claim 1, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 30 mm.
14. The surgical instrument of claim 13, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 25 mm.
15. The surgical instrument of claim 14, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 20 mm.
16. The surgical instrument of claim 15, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 16 mm.

17. The surgical instrument of claim 15, wherein the housing, at least in a portion housing the stator, has an outer diameter of between about 15 mm and about 16 mm.
18. The surgical instrument of claim 13, wherein the stator has a length of less than about 100 mm.
19. The surgical instrument of claim 18, wherein the stator has a length of less than about 60 mm.
20. The surgical instrument of claim 19, wherein the stator has a length of less than about 50 mm.
21. The surgical instrument of claim 19, wherein the stator has a length in the range of between about 40 mm and about 50 mm.
22. A surgical instrument, comprising:
 - a housing;
 - an electrical power source;
 - an output shaft extending from the housing;
 - a rotor coupled to the output shaft; and
 - a stator having:
 - a winding selectively connectable to the electrical power source,
 - wherein the winding is a self-supporting winding; and
 - a magnetically conductive portion disposed about the rotor and comprising a plurality of laminations;wherein selectively connecting the electrical power source and the stator windings imparts rotary motion to the output shaft via the rotor.
23. The surgical instrument of claim 22, wherein the self-supporting winding is selected from the group consisting of a Faulhaber winding, a rhombic winding, concentric windings, or a self-supporting winding A.

24. The surgical instrument of claim 23, wherein the self-supporting winding is a self-supporting winding A.
25. The surgical instrument of claim 23, wherein the winding comprises a rectangular shaped conductive element.
26. The surgical instrument of claim 23, wherein the winding comprises a conductive element and a thermoplastic element, wherein the thermoplastic element is disposed about the conductive element.
27. The surgical instrument of claim 22, wherein each of the plurality of stator laminations has a thickness of less than about 0.25 mm.
28. The surgical instrument of claim 22, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 30 mm.
29. The surgical instrument of claim 28, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 25 mm.
30. The surgical instrument of claim 29, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 20 mm.
31. The surgical instrument of claim 30, wherein the housing, at least in a portion housing the stator, has an outer diameter of less than about 16 mm.
32. The surgical instrument of claim 31, wherein the housing, at least in a portion housing the stator, has an outer diameter of between about 15 mm and about 16 mm.
33. The surgical instrument of claim 28, wherein the stator has a length of less than about 100 mm.

34. The surgical instrument of claim 28, wherein the stator has a length of less than about 60 mm.
35. The surgical instrument of claim 29, wherein the stator has a length of less than about 50 mm.
36. The surgical instrument of claim 29, wherein the stator has a length in the range of between about 40 mm and about 50 mm.
37. An electric motor for use in a surgical procedure, comprising:
a motor output member;
a driven member coupled to the motor output member; and
a driving member having a winding and a magnetically conductive portion disposed proximate the driven member such that energizing the driving member imparts motion to the driven member,
wherein at least a portion of the driven member comprises a magnet having a remanence greater than or equal to about 1 T, and
wherein the winding is a self-supporting winding.
38. The electric motor of claim 37, wherein each of the laminations have a thickness of less than or equal to about 0.20 mm
39. The motor of claim 37, wherein the motor is adapted for placement in an instrument having an outside diameter of less than about 25 mm.
40. The motor of claim 39, wherein the motor is adapted for placement in an instrument having an outside diameter of less than about 20 mm.
41. The motor of claim 40, wherein the stator has a length of less than about 50 mm.